

REMARKS

The *Office Action* contended that Claim 1 was rejected as being indefinite under 35 U.S.C. §112 for failing to particularly point out and distinctly claim the subject matter which Applicant regards as the invention.

Applicant has amended Claim 1 to be consistent with the claim language suggested by the Examiner on Page 2 of the *Office Action*. Applicant appreciates the Examiner's courtesy in providing the proposed claim language.

The present invention addresses the problem of ceramic dispersion on the inner surface of metal halide lamp bulbs. Metal halide lamps are commonly used in outdoor lighting and high-ceiling lighting. These lamps have a high luminous intensity, which generates a large amount of heat within the bulb. In a traditional arc-shaped metal halide lamp, the arc tube is formed close to the surface of the bulb. When exposed to high temperatures, ceramic particles from the arc tube may be dispersed along the inner wall of the lamp bulb. The dispersed ceramic causes discoloration of the bulb, which decreases the quality of emitted light.

As can be determined from Claim 1, our invention provides a relationship between the internal diameter of the casing tube and the external diameter of the arc tube which results in a metal halide lamp that does not experience discoloration of the casing tube, and which does not exhibit a decrease in the quality of emitted light, or lumen maintenance, when exposed to high temperatures during illumination.

As can be appreciated not only in the prior art cited, but further by the widespread use of metal halide lighting for outdoor lighting and high-ceiling lighting around the world, this is a highly competitive electronics field with large companies, employing scientists and engineers,

attempting to seek competitive improvements. In this environment, improvements that further our design goals have a significant impact and should be considered in determining the obviousness of the present invention.

“Thus when differences that may appear technologically minor nonetheless have a practical impact, particularly in a crowded field, the decision-maker must consider the obviousness of the new structure in this light.”

Continental Can Co. USA Inc. v. Monsanto Co., 20 U.S.P.Q. 2d. 1746, 1752 (Fed. Cir. 1991).

The *Office Action* rejected Claim 1-4, 9 and 11 as being unpatentable over *Zhu et al.* (US Patent Application No. 2003/0141826, hereinafter *Zhu*) under 35 U.S.C. §103(a).

Zhu addresses the problem of arc discharge metal halide lamps exhibiting a strong green hue when the lamps are dimmed. (*Zhu*, Para. 0004). Dimming the lamps saves energy and increases the efficacy, or lumens per watt, of the lamps. *Zhu* eliminates the green hue emitted from the lamps during dimming by providing specific quantities of active materials in the discharge region contained within arc discharge chamber. (*Zhu*, Paras. 0044-0047)

The Office Actions concedes that *Zhu* fails to disclose that “ $R/r \geq 3.0$, where R is an internal diameter of the casing tube and r is an external diameter of the arc tube.” (*Office Action*, Page 4). However, the *Office Action* states that “one having ordinary skill in the art would understand that the arc tube of a metal halide lamp operates at a very high temperature, and conventionally the outer casing is spaced away from the arc tube so that the outer casing is not subject to high heat during operation, and heat cycling when the lamp is turned on and off, which can lead to cracking of the outer casing.” *Id.*

The specific teaching of the present invention is to prevent discoloration of the bulb by having providing an internal diameter of a casing tube (R) to be proportional to an external diameter of the arc tube (r), so that the ratio R/r is greater than or equal to 3.0. While it may be generally understood in the art that the arc tube of a metal halide lamp operates at a very high temperature, it is not generally understood that by spacing the casing tube and arc tube apart, discoloration of the inner surface of the casing tube can be prevented.

The problem with conventional metal halide lamps is that the arc tube and the casing tube are not spaced far enough apart so that ceramic from the arc tube is dispersed onto the internal surface of the casing tube when the arc tube reaches high temperatures. The dispersed ceramic causes discoloration of the casing tube, which decreases the quality of appearance, and reduces lumen maintenance, of the lamp.

Contrary to the *Office Action*, our invention is not aimed at preventing "cracking of the outer casing", but rather our invention provides a ratio of the casing tube diameter and arc tube diameter that directly reduces discoloration of the casing tube and improves lumen maintenance.

For example, when the internal diameter "R" of the casing tube is 19 mm or larger, the external diameter "r" of the arc tube is 6.4 mm, so that a ratio R/r of at least 3.0 is achieved. With these tube diameters, there is ample space between the casing tube and the arc tube so that a thermal insulation effect of the casing tube on the arc tube is reduced. As a result, the maximum temperature of the external surface does not reach a temperature at which the ceramic forming the arc tube evaporates and disperses on the inner surface of the casing tube. (*Specification*, Paras. 0068-0070). Furthermore, with these tube diameters, the lumen maintenance after a 500-hour lighting period and after a 12,000-hour lighting period is no less

than 85% and 50% respectively. These percentages are a practically acceptable and are based on market demands. (*Specification*, Para. 0067).

When the internal diameter "R" of the casing tube is at least 30 mm, and the external diameter "r" of the arc tube is 6.4 mm, so that a ratio R/r of at least 4.7 is achieved. With these tube diameters, the discoloration of the inner surface of the casing tube is extremely insignificant, and the lumen maintenance after a 500-hour lighting period and after a 12,000-hour lighting period is no less than 97% and 80%, respectively.

On the other hand, when the internal diameter "R" of the casing tube is 18 mm or less, and the external diameter "r" of the arc tube is 6.4 mm, the ratio R/r equals 2.81, which is less than the claimed ratio of at least 3.0 of the present invention. With these tube diameters, there is significant discoloration of the inner surface of the casing tube. Furthermore, the lumen maintenance after a 500-hour lighting period and after a 12,000-hour lighting period was 75% and 40%, respectively, and thus the results failed to satisfy the practically acceptable levels of lumen maintenance.

Figure 3 below shows the relationship between the ration R/r and the amount of inner surface discoloration of the casing tube, as well as lumen maintenance. As the ratio R/r increases, there is decreased discoloration, as well as increased lumen maintenance. This data is based on the analysis provided in Paras. 0066-0071 of the *Specification*.

FIG.3

METER BODY	R/r	APPEARANCE OF COLORING	LUMEN MAINTENANCE		ASSESSMENT
			500-HOUR LIGHTING PERIOD	12000-HOUR LIGHTING PERIOD	
	2.8	SIGNIFICANT	75	40	BAD
	3.0	LESS SIGNIFICANT	85	50	GOOD
	3.9	INSIGNIFICANT	95	55	GOOD
	4.7	EXTREMELY INSIGNIFICANT	97	80	VERY GOOD
	8.0	EXTREMELY INSIGNIFICANT	97	80	VERY GOOD

Thus, our invention reduces the dispersion of ceramic from the arc tube by achieving a specific ratio between the diameters of the arc tube and casing tube. Reduction of ceramic dispersion from the arc tube reduces discoloration on the inner surface of the casing tube and improves lumen maintenance. One having ordinary skill in the art would not understand that the relationship between the diameters of the arc tube and casing tube directly affect the dispersion of ceramic from the outer surface of the arc tube. Contrary to the *Office Action*, our invention is not concerned about preventing “cracking of the outer casing” by spacing the outer casing “away from the arc tube so that the outer casing is not subject to high heat during operation.” (*Office Action*, Page 4).

Accordingly, Applicant submits that a person of ordinary skill in the field would not be taught to seek an optimum range in the manner of our invention. If the rejection is maintained, applicant would request a specific reference to justify the rejection.

As noted in MPEP §2144.03

It would not be appropriate for the examiner to take official notice of facts without citing a prior art reference where the facts asserted to be well known are not capable of instant and unquestionable demonstration as being well-known... . If applicant adequately traverses the examiner’s assertion of official notice, the examiner must provide documentary evidence in the next Office Action if the rejection is to be maintained.

If Application aimed to only prevent “cracking of the outer casing” as asserted by the *Office Action*, our invention would not reduce discoloration and would not improve lumen maintenance, as preventing cracking of the casing tube does not correlate to preventing dispersion of ceramic from the arc tube to the inner surface of the casing tube. Cracking of the casing tube results from hardening of the tube due to high temperatures. Our invention does not aim to prevent the hardening of the casing tube, but instead aims to reduce the amount of dispersed ceramic that builds up on the inner surface of the casing tube.

It is respectfully submitted that a person of ordinary skill in the field lacking the advantages of hindsight from our present disclosure, would not be led to read *Zhu* with the proposed assumptions in the *Office Action*, and even assuming that the function of *Zhu* could be altered as proposed in the *Office Action* rejection, would still not meet the features of Claim 1.

The *Office Action* rejected Claims 5 and 6 as being unpatentable over *Zhu* in view of *Gu et al.* (US Patent No. 6,441,564, hereinafter *Gu*) under 35 U.S.C. §103(a).

Gu discloses a dimmable light source with higher efficacy that can be substituted for a white high-pressure sodium light source with comparable efficacy and having much higher efficiencies than an incandescent tungsten halogen light source. (*Gu*, Col. 2, Lines 34-36). *Gu* achieves this by introducing cesium into the arc tube and by operating the light source in a pulsed mode. (*Gu*, Col. 1, Lines 18-24).

The *Office Action* contended that it would have been obvious to modify *Zhu* with a teaching of *Gu* in order to “construct a metal halide lamp where the arc tube is disposed in a hermetically-sealed space, and a degree of vacuum in the space is no more than 1×10^1 Pa at 300K.” (*Office Action*, Pages 5-6). The *Office Action* further states that “one having ordinary

skill in the art would understand that a space kept under vacuum would have a pressure of no more than 1×10^1 Pa at 300K.” (*Office Action*, Page 6).

Our invention aims to prevent a decrease in luminous intensity by specifying the degree of the vacuum pressure inside the casing tube to be no more than 1×10^1 Pa at 300K. When the degree of the vacuum pressure inside the casing tube is no more than 1×10^1 Pa at 300K, heat from the arc tube is not easily transferred to the casing tube through the gas in the sealed space of the casing tube. As a result, the heat released to the outside of the metal halide lamp is reduced, and therefore a decline in the luminous efficiency due to the heat loss is avoided. (*Specification*, Page 10, Lines 15-22).

On the other hand, when the degree of the vacuum pressure inside the casing tube exceeds 1×10^1 Pa at 300K, the heat of the arc tube is more easily transferred to the casing tube through the gas. As a result, the heat tends to be released to the outside of the metal halide lamp, and therefore there is a chance that the luminous efficiency will decline due to the heat loss. (*Specification*, Page 10, Line 23 – Page 11, Line 4).

The vacuum pressure of 1×10^1 Pa at 300K specified by our invention has a specific purpose of preventing heat transfer through the gas from the arc tube to the casing tube. Accordingly, Applicant submits that a person of ordinary skill in the field would not understand that a space kept under vacuum would have a pressure of no more than 1×10^1 Pa at 300K. If the rejection is maintained, applicant would request a specific reference to justify the rejection as noted in MPEP §2144.03 above.

The *Office Action* rejected Claims 7, 8, and 10 as being unpatentable over *Zhu and Gu*, and further in view of *De Maagt et al.* (US Patent No. 5,986,405, hereinafter *De Maagt*) under 35 U.S.C. §103(a).

De Maagt discloses a lamp which utilizes an oxygen dispenser. The oxygen dispenser contains silver oxide which reacts with hydrocarbons in the lamp, thereby preventing blackening of the outer envelope of the lamp. (*De Maagt*, Col. 2, 62-67).

Our invention discloses the use of oxygen-releasing getters which contain barium peroxide. (*Specification*, Page 26, Lines 15-18). *De Maagt* teaches away from using barium peroxide in the oxygen getters, stating "barium oxide as an oxygen generator in an oxygen dispenser was found to be of little value", and instead discloses using an oxygen getter containing silver oxide. (*De Maagt*, Col 2, Lines 20-59).

"A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant." *In re Gurley*, 27 F.3d 551, 553 (Fed. Cir. 1994); see *KSR*, 127 S. Ct. at 1739-40 (explaining that when the prior art teaches away from a combination, that combination is more likely to be nonobvious). Additionally, a reference may teach away from a use when that use would render the result inoperable. *McGinley v. Franklin Sports, Inc.*, 262 F.3d 1339, 1354 (Fed. Cir. 2001).

In re Icon Health and Fitness, Inc. 2007 U.S. App. Lexis 18244,
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Furthermore, Applicant submits that any combination of references that must be modified beyond their express functions is suggestive of an unintended use of hindsight that may have been utilized to drive the present rejection. This is particularly true for an examiner who is attempting to provide a diligent effort that only patentable subject matter occurs. The KSR Guidelines do not justify such an approach. There is still a requirement for the Examiner to step

back from the zeal of the examination process and to appreciate that a Patent Examiner has to wear both hats of advocating a position relative to the prior art while at the same time objectively rendering in a judge-like manner a decision on the patentability of the present claims.

As set forth in MPEP 2142,

To reach a proper determination under 35 U.S.C. §103, the examiner must step backward in time and into the shoes worn by the hypothetical "person of ordinary skill in the art" when the invention was unknown and just before it was made. In view of all factual information, the examiner must then make a determination whether the claimed invention "as a whole" would have been obvious at that time to that person. Knowledge of applicant's disclosure must be put aside in reaching this determination, yet kept in mind in order to determine the "differences," conduct the search and evaluate the "subject matter as a whole" of the invention. The tendency to resort to "hindsight" based upon applicant's disclosure is often difficult to avoid due to the very nature of the examination process. However, impermissible hindsight must be avoided and the legal conclusion must be reached on the basis of the facts gleaned from the prior art.

Our invention recognizes the difficulty in achieving a metal halide lamp with a high luminous efficiency, while decreasing discoloration and improving lumen maintenance. To decrease discoloration of the casing tube and improve lumen maintenance, our invention reduces dispersion of ceramic from the arc tube onto the inner surface of the casing tube. Our invention provides specific ratios of the diameters of the arc tube and the casing tube which result in reduced ceramic dispersion during illumination.

It is respectfully submitted that a person of ordinary skill in the field lacking the advantages of hindsight from our present disclosure, would not be led to combining the *Zhu, Gu*, and *De Maagt* references, and even if combined and assuming that their respective functions could be altered as proposed in the *Office Action* rejection, would still not meet the features of Claim 1.

Claims 2-11 depend from Claim 1. The dependent claims add features that more particularly define the invention and further distinguish over the cited references and prior art of record.

With regards to the obviousness double patenting rejection of Claims 1-6 and 11, Applicant reserves the right to file a Terminal Disclaimer if the other rejections to Claims 1-6 and 11 are withdrawn. However, it is believed that the current claim language of our Claim 1 is sufficiently different to not require a Terminal Disclaimer.

In view of the amendment to the present claims, it is believed that the case is now in condition for allowance and an early notification of the same is requested.

If the Examiner believes that a telephone interview will help in the prosecution of this matter, the undersigned attorney can be contacted at the listed phone number.

Very truly yours,

SNELL & WILMER L.L.P.



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